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F24F F24C F23J

(54) Kitchen exhaust fans

(57) A kitchen exhaust fan has a casing 1 and a fan unit 41 in the upper part of the casing, a first filter net 20 across the casing, a second filter net 21 above the first filter net 20, and water spray devices 25, 26, disposed in the space 2 between the first filter net 20 and second filter net 21 to form water spray curtains. A lower panel 10 is provided at the lower part of the casing 1 to collect the water from the water spray devices 25, 26. Kitchen fumes are drawn into the casing to come in contact with the water spray curtains whereby oily particles contained in the kitchen fumes are condensed.

*oil particles + water spray
→ larger particles for filter*

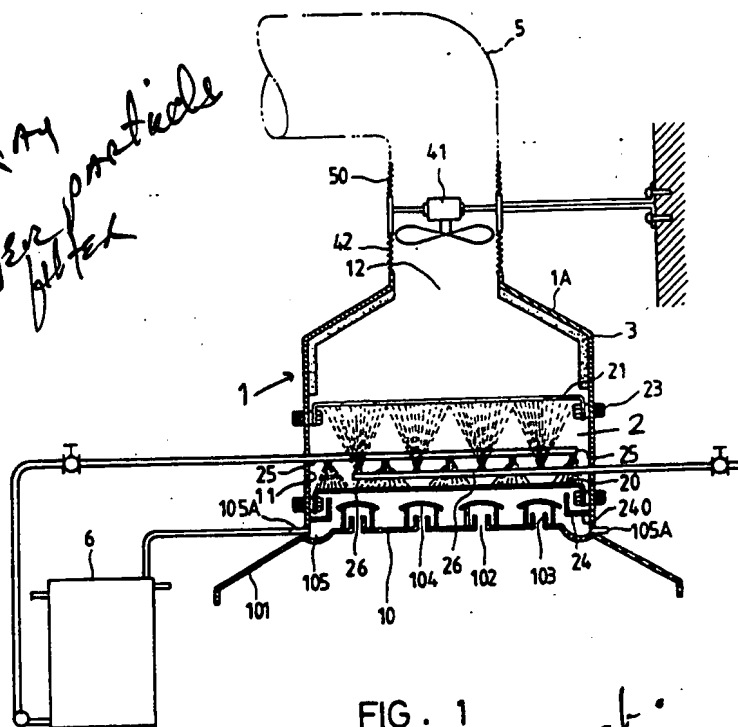


FIG. 1

ack.

*Is not
Vance
410466
410466 3878
410274 1035*

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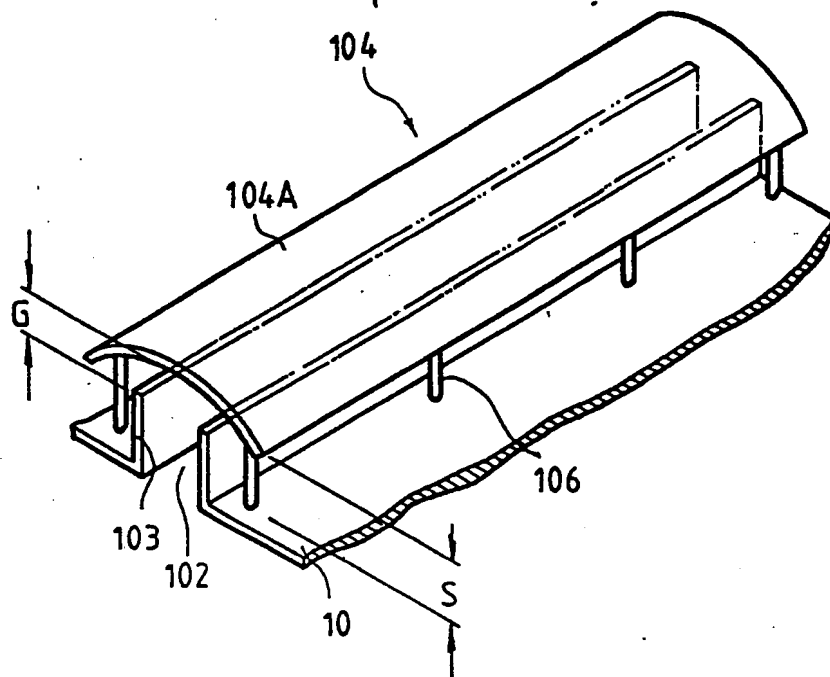


FIG. 2

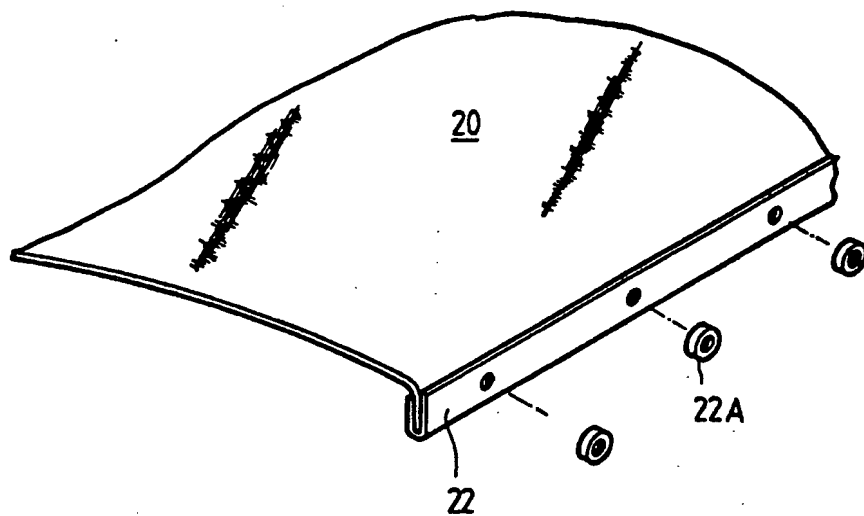


FIG. 3

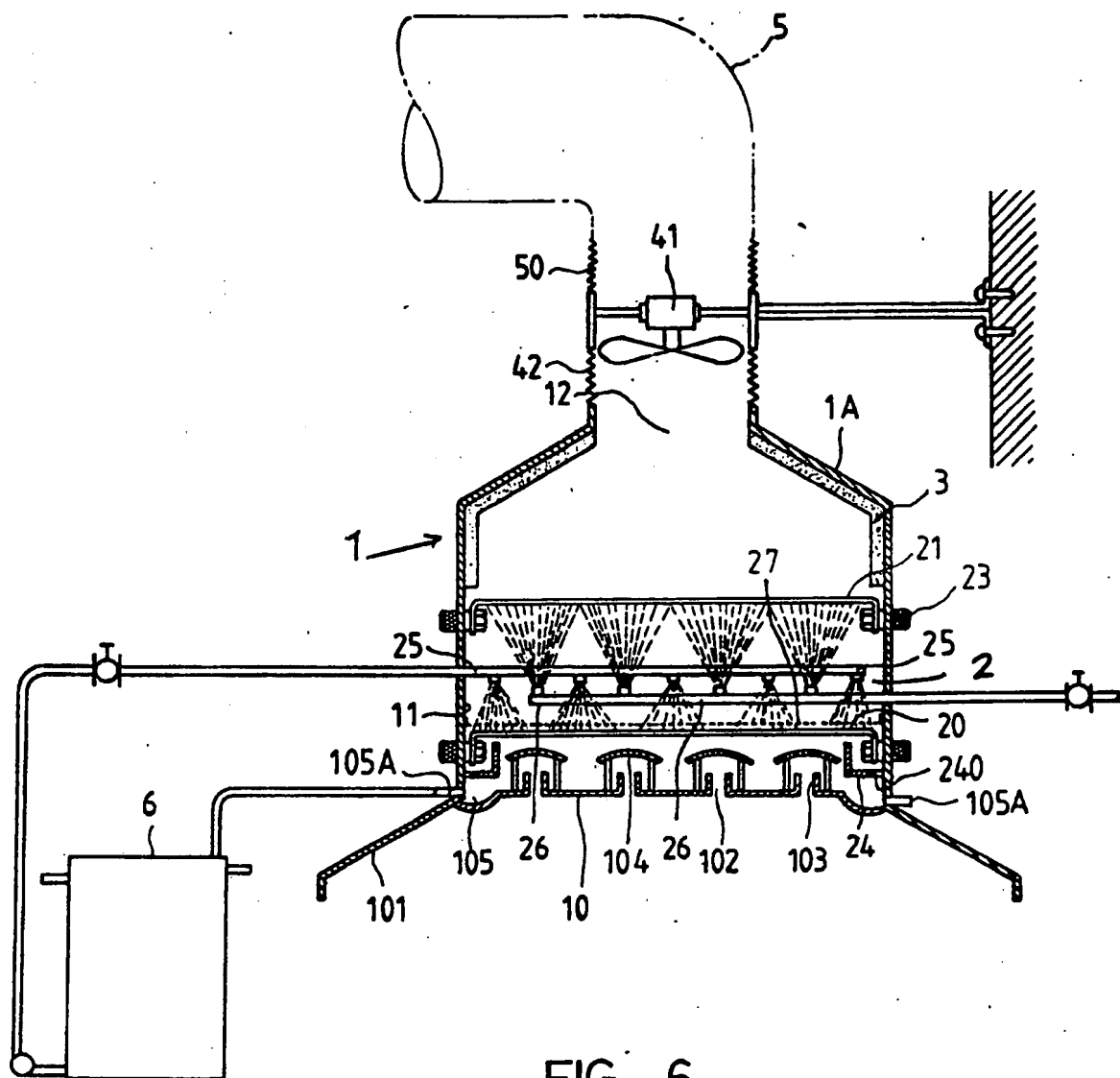


FIG. 6

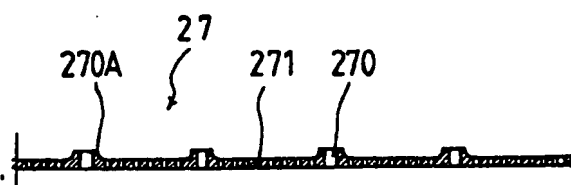


FIG. 7

KITCHEN EXHAUST FANS

This invention relates to kitchen exhaust fans capable of drawing kitchen fumes out of a kitchen when
5 the kitchen is in use.

Kitchen fumes contain oily vapour that tends to contaminate the kitchen environment. More particularly, the oily vapour contained in the kitchen fumes consists of a number of fine oily particles that tend to stick
10 onto any object with which they come in contact. Thus, the exhaust fan itself and other facilities quickly become contaminated if the oily particles are not removed from the kitchen fumes, before the kitchen fumes are drawn out by the exhaust fan.

15 In order to remove the oily particles from the kitchen fumes, exhaust fans are commonly provided with a filtering device. The filtering device may be of a wire net screen type or of a woven or non-woven fabric sheet type. However, the oily particles contained in the
20 kitchen fumes are so fine that a fine mesh wire net screen or a fine fabric sheet is required to filter the oily particle satisfactorily. A fine mesh wire net screen or a fine fabric sheet constitutes a substantial resistance to the flow of the kitchen fumes, therefore
25 the capability and the efficiency of conventional kitchen exhaust fans are generally very limited.

In contrast to the above-mentioned problems with conventional kitchen exhaust fans, the present invention offers an improved kitchen exhaust fan with a filtering
30 device which effectively filters oily vapour from kitchen fumes without significantly impairing the flow rate of the kitchen fumes being drawn by the exhaust fan.

According to the present invention, a kitchen exhaust fan comprises:

35 a casing;

a fan unit at an upper end of said casing;
a first filter net disposed across the interior of
said casing;

a second filter net disposed above said first filter
5 net to form a space between said first filter net and
said second filter net; and

means for producing a water spray curtain in said
space.

The oily vapour contained in kitchen fumes is drawn
10 by the fan unit to pass through the casing. Relatively
large particles of the oily vapour are collected by the
first filter net. The oily vapour containing relatively
small particles is then drawn to come in contact with the
water spray curtain between the first filter net and
15 second filter net whereby the oily vapour is cooled to
become condensed. The fine oily particles are coagulated
to become relatively large particles which are then
collected by the second filter net. *

The means for producing a water spray curtain may
20 comprise a first water spray unit which sprays water
towards first filter net, and a second water spray unit
which sprays water towards second filter net, so that the
oily particles collected by the first filter net and the
second filter net are washed away by the water sprays.

25 Preferably:

said casing is provided with a lower panel having a
plurality of slots, each one of which is associated with
an arcuate strip to form therewith a respective trap;
said lower panel has side edges formed into a continuous
30 ditch for collecting the water dripped from said first
filter net and said second filter net, said ditch being
provided with a drain tube; a water recovery unit is
provided; and said water recovery unit is connected to
said drain tube for recovering water drained through said
35 drain tube, and the water recovered from said water

recovery unit is supplied to said first water spray unit by a circulation pump.

A water distribution plate may be disposed immediately above said first filter net, said water
5 distribution plate having a plurality of large holes and a plurality of small holes, each one of said large holes being associated with an upright flange.

Two kitchen exhaust fans, in accordance with the present invention, will now be described, by way of
10 example only, with reference to the accompanying drawings, in which:-

Fig. 1 is a schematic, cross-sectional view of a first embodiment of the kitchen exhaust fan of this invention;

15 Fig. 2 is a fragmentary, perspective view of a trap device employed in the kitchen exhaust fan of Fig. 1;

Fig. 3 is a fragmentary, perspective view of a filter net employed in the kitchen exhaust fan of Fig. 1;

Fig. 4 is a fragmentary, cross-sectional view of a
20 filter net employed in the kitchen exhaust fan of Fig. 1;

Fig. 5 is a schematic, cross-sectional view of a water recovery unit employed in the kitchen exhaust fan of Fig. 1;

Fig. 6 is a schematic, cross-sectional view of a
25 second embodiment of the kitchen exhaust fan of this invention; and

Fig. 7 is a cross-sectional view of the distributor plate employed in the kitchen exhaust fan of Fig. 6.

As shown in Fig. 1, the first embodiment of the
30 kitchen exhaust fan of this invention includes a generally rectangular, box-shaped casing 1 having a lower panel 10, a hood 101 extending downwardly and outwardly from the lower edges of side walls 11 of casing 1, a plurality of trap devices 104 on lower panel 10, a first
35 filter net 20 across the interior of casing 1, a second

filter net 21 above first filter net 20, to form a space
2 between first filter net 2 and second filter net 21, a
plurality of water spray devices 25, 26 disposed in space
2, a converging upper panel 1A having an outlet port 12,
5 and a fan unit 41 disposed in outlet port 12.

Lower panel 10 is formed with a plurality of slots
102 having upright side walls 103. Trap device 104
consists of an elongate, arcuate strip 104A, as shown in
Fig. 2, to correspond with a slot 102. Arcuate strip
10 104A is mounted on lower panel 10 by posts 106 to
maintain a gap G between the upper edge of upright side
walls 103 and the lower surface of arcuate strip 104A,
and a distance S between the side edge of arcuate strip
104A and the upper surface of lower panel 10. Trap
15 device 104 causes kitchen fumes, drawn by fan unit 41 to
enter casing 1 through a slot 102, to make an abrupt turn
over side walls 103 and side edges of arcuate strip 104A.
At the same time, water from water spray devices 25, 26
is prevented from dripping through the slot 102. The
20 side edges of lower panel 10 are formed into a ditch 105
so as to collect the water accumulated on the upper
surface of lower panel 10. A drain tube 105A is provided
to communicate ditch 105 with a water recovery unit 6, so
as to direct the water collected in ditch 105 to water
25 recovery unit 6.

First filter net 20 is disposed above trap devices
104 across the interior of casing 1. First filter net 20
may be made of a woven or non-woven fabric sheet or a
fine-mesh net screen, and is preferably formed into a
30 wavy shape as shown in Fig. 4. It is fastened by
fasteners 23 with respect to side walls 11 of casing 1
with its edges bent and inserted into a frame member 22
having a U-shaped cross section, as shown in Fig. 3.
Appropriate spacers 22A are placed between frame member
35 22 and the inner face of side wall 11 of casing 1, so as

to form a space to allow the water sprayed onto the inner face of side wall 11 to flow therethrough. A channel 24 is fixed onto the inner face of side wall 11 below the junction of first filter net 21 and side wall 11 to collect the water flowing down along the inner face of side wall 11 of casing 1. A plurality of small drain holes 240 is formed in the channel 24 to allow the water collected in the channel 24 to flow down to ditch 105.

Second filter net 21 is identical with first filter net 20 and is disposed above first filter net 20, with an appropriate space 2 between first filter net 20 and second filter net 21 to accommodate the water spray devices 25, 26 in said space 2.

Water spray devices 25, 26 consist of a first water spray unit 25 which comprises a plurality of tubes having spray nozzles or orifices disposed towards first filter net 20, and a second water spray unit 26 which comprises a plurality of other tubes having spray nozzles or orifices disposed towards second filter net 21.

In use, fresh water with adequate pressure is supplied to the tubes of second water spray unit 26 and the water recovered by the water recovery unit 6 is supplied, with adequate pressure, to the tubes of first water spray unit 25. Thus a water spray curtain towards first filter net 20 and another water spray curtain towards second filter net 21 are formed in space 2 between first filter net 20 and second filter net 21.

Kitchen fumes containing oily vapour, or oily particles, are drawn by the fan unit 41 to pass through slots 102 of lower panel 10 of casing 1, and are interrupted by arcuate strips 104A of trap devices 104 to make an abrupt turn before moving towards first filter net 20. When kitchen fumes make the abrupt turn, some of the relatively large oily particles are separated from the stream of kitchen fumes and are dropped onto the

upper side of lower panel 10. As soon as the kitchen fumes reach and pass first filter net 20, the remaining relatively large oily particles are caught and collected by first filter net 20. The relatively small oily particles contained in the kitchen fumes which have passed through first filter net 20 encounter water spray curtains formed in space 2 between first filter net 20 and second filter net 21, whereby the oily particles are either cooled to become condensed or merged with water particles. As a result, the oily particles are caused to become relatively large particles which are then caught and collected by second filter net 21 when the kitchen fumes pass through second filter net 21.

~~*~~
oil
merge w/
water

The oily particles collected by first filter net 20 and second filter net 21 are washed away by the water sprays to become a sludge, which either drips down onto lower panel 10 or flows down along the inner face of side wall 11 of casing 1 to ditch 105. The sludge dripped onto lower panel 10 is also collected by ditch 105 from which the sludge mixed with water flows through drain tube 105A to water recovery unit 6.

The kitchen fumes having passed through second filter net 21 are free from oily particles and can be further drawn by fan unit 41 to be dispersed outside of the kitchen.

In order to facilitate the installation of the exhaust fan assembly, and also to prevent vibrations created by fan unit 41 from spreading to other parts, bellows type sleeve couplings 42 and 50 are employed in the connections between fan unit 41 and casing 1, and between fan unit 41 and exhaust duct 5.

In order to suppress noise produced by fan unit 41 and the water sprays, a noise absorbing lining 3, which may be made of foamed plastics or non-woven fabric, is

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attached onto the inside surface of upper panel 1A in the upper part of casing 1.

Water recovery unit 6, as shown in Fig. 5, consists of a tank 6A, which is separated into first chamber 60, second chamber 61, and third chamber 62 by first partition 6B having a lower opening 6B-1, and a second partition 6C having an upper opening 6C-1. A filter screen 63 is provided in the upper part of first chamber 60. First chamber 60 is provided with an inlet tube 64 at the upper end of first chamber 60, and a drain tube 65 slightly above the level of filter screen 63. Third chamber 62 is provided with an overflow tube 66 at the same level as drain tube 65 of first chamber 60. A circulation pump 67 is provided at the lower end of third chamber 62.

Inlet tube 64 is connected to drain tube 105A of the kitchen exhaust fan, and circulation pump 67 has an outlet connected to the tubes of first water spray unit 25. The water containing oily sludge collected in ditch 105A is directed to first chamber 60 of water recovery unit 6 through drain tube 105A and inlet tube 64. The incoming water with sludge is filtered by filter screen 63 to collect the major part of the sludge which is drained through drain tube 65. The water with the remaining sludge flows through opening 6B-1 of first partition 6B and enters second chamber 61, and further passes through upper opening 6C-1 of second partition 6C to enter third chamber 62. While passing through upper opening 6C-1 of second partition 6C, the remaining sludge contained in the water remains afloat and flows through overflow tube 66, so as to allow water free from oily sludge to flow down third chamber 62 to be re-circulated by circulation pump 67. Excess water in water recovering unit 6 is drained through overflow tube 66.

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Fig. 6 shows a second embodiment of the kitchen exhaust fan of this invention. In this embodiment, a water distribution plate 27 is employed in the arrangement of the kitchen exhaust fan of the first embodiment. Water distribution plate 27 has a plurality of relatively large holes 270 and relatively small holes 271 evenly distributed over the entire area of water distribution plate 27. Each one of large holes 270 is associated with an upright flange 270A and each one of small holes 271 is made flush with the surface of water distribution plate 27, as shown in Fig. 7.

Water distribution plate 27 is disposed immediately above first filter net 20, so as to ensure that the water spray from first water spray unit 25 is uniformly applied and distributed over first filter net 20. Large holes 270 of water distribution plate 27 allow the kitchen fumes to pass therethrough freely, and upright flanges 270A facilitate a uniform distribution of the water through small holes 271. In this arrangement, the water distribution plate 27 ensures an even and uniform distribution of water over first filter net 20 in case of loss of pressure in first water spray unit 25.

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CLAIMS

1. A kitchen exhaust fan, comprising:
 - a casing;
 - a fan unit at an upper end of said casing;
 - 5 a first filter net disposed across the interior of said casing;
 - a second filter net disposed above said first filter net to form a space between said first filter net and said second filter net; and
 - 10 means for producing a water spray curtain in said space.
2. A kitchen exhaust fan according to claim 1, wherein said casing is provided with a lower panel having a plurality of slots, each one of which is associated
15 with an arcuate strip to form therewith a respective trap.
3. A kitchen exhaust fan according to claim 1 or claim 2, wherein said means for producing a water spray curtain comprises a first water spray unit for spraying
20 water towards said first filter net, and a second water spray unit for spraying water towards said second filter net.
4. A kitchen exhaust fan according to claim 2 and claim 3, wherein said lower panel has side edges formed
25 into a continuous ditch for collecting the water dripped from said first filter net and said second filter net, said ditch being provided with a drain tube.
5. A kitchen exhaust fan according to any preceding claim, wherein a water recovery unit is provided and the
30 water recovered from said water recovery unit is returned to said means for producing a water spray curtain.
6. A kitchen exhaust fan according to claim 4 and claim 5, wherein said water recovery unit is connected to said drain tube for recovering water drained through said
35 drain tube, and the water recovered from said water

recovery unit is supplied to said first water spray unit by a circulation pump.

7. A kitchen exhaust fan according to any preceding claim, wherein a water distribution plate is disposed
5 immediately above said first filter net, said water distribution plate having a plurality of large holes and a plurality of small holes, each one of said large holes being associated with an upright flange.

8. A kitchen exhaust fan substantially as
10 hereinbefore described with reference to Figs. 1 to 5, or Figs. 6 and 7, of the accompanying drawings.

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